Abstract

In deep–inelastic scattering at squared four–momentum transfers $Q^2 \gg m_c^2$ where the mass m_Q of the additive quark is $m_c \simeq m_Q \approx 0.3$ GeV, the virtual photon can transfer its energy to the quark during a time interval $\tau_P \simeq \nu/Q^2$. With respect to perturbative QCD, the cross section for this process is $\sim 1/Q^2$; moreover, during the time interval $\tau_F \simeq \nu/m_c^2 \gg \tau_P$, the point–like configuration *must* transform into a normal–sized hadron. Between the time interval $\tau_P < t < \tau_F$, this point–like quark or quark–gluon configuration can interact with nuclear matter with only small cross section. Such a delayed hadronization mechanism will increase the yield of hadrons (in particular, π^+–mesons) relative to the case when hadron production can take place at the virtual–photon quark interaction point. This hadronization process can be studied at energies available after the first energy upgrade at CEBAF; namely, at a beam energy of 6.0 GeV.

We propose to measure in Hall A the inclusive electroproduction of $\pi^{\pm}$–mesons on ^{1}H and π^+–mesons on ^{2}H, ^{40}Ca, and ^{208}Pb utilizing the $(e, e'\pi^{\pm})$ reaction for $1.0 \le Q^2$ (GeV/c)$^2 \le 2.5$, at an invariant energy $W > 1.92$ GeV, and at $x_B = 0.3$. From a Q^2–dependent analysis of the nuclear matter transparency, we can extract information about the space–time scale for the mechanism of quark hadronization.